Roll No

B.E (Full Time) DEGREE **ARREAR** EXAMINATIONS, April/May 2013
INDUSTRIAL ENGINEERING
FIFTH SEMESTER (Regulation 2008)

13

IE 9303 STATISTICAL QUALITY CONTROL

Time: 3 Hours Max.Marks: 100

Answer all questions
Use of statistical tables permitted

PART – A (10 x 2 = 20 marks)

1. What are the quality objectives?
2. What is the relation between quality and productivity?
3. What is assignable variation?
4. What are warning control limits?
5. What is a demerit control chart?
6. What are the advantages of using attribute control charts over variable charts?
7. What is acceptable quality level (AQL)?
8. What are the parameters of OC curve?
9. What is destructive testing? Give some examples of items tested by this method?
10. What is a coordinate measuring machine?

PART – B (5 x 16 = 80 marks)

11. The following data were obtained over a ten day period to initiate $\bar{X}$ and R control charts for a quality characteristic that had required more rework. The data obtained were from a single machine and same operator. The subgroup size was 5.

Subgroup No.	$\bar{X}$	R	Subgroup No.	$\bar{X}$	R
1	177.6	23	11	179.8	9
2	176.6	8	12	176.4	8
3	178.4	22	13	178.4	7
4	176.6	12	14	178.2	4
5	177.0	7	15	180.6	6
6	179.4	8	16	179.6	6
7	178.6	15	17	177.8	10
8	179.6	6	18	178.4	9
9	178.8	7	19	181.6	7
10	178.2	12	20	177.6	10

i) Determine trial control limits for $\bar{X}$ and R control charts.
ii) What preliminary conclusions can you draw about the process control?

iii) If the specification for the quality characteristic is 170 ± 11, determine whether the process meets the specification.

12 a. i) Explain the activities carried out by Quality Planning? (6)
ii) Explain the various types of quality costs. (6)
iii) Explain the quality loss function for nominal the best quality characteristic. (4)

(OR)

b) A manufacturing process has been operating in control at a mean of 65.00 mm with upper and lower control limits of 65.225 and 64.775 respectively. The process standard deviation is known to be 0.15 mm and specifications on the dimension are 65.00 ± 0.50 mm.

i) What is the probability of not detecting the shift in the mean to 64.75 mm on the first sample taken after the shift? The sample size is four.

ii) What proportion of nonconforming product result from the shift mentioned in (i)?

iii) Compute the process capability indexes C_p and C_{pk} for this process and comment relative to part (i) and (ii) above.

13 a i) The following data has been collected from a small textile mill. Develop a suitable control chart for monitoring the defects.

Day :	1	2	3	4	5	6	7	8	9	10
Bolts of Cloth :	20	20	20	21	22	22	23	33	23	21
No.of defects:	37	23	30	28	34	31	37	24	36	27

. ii) A control chart for the number of nonconforming piston rings is maintained on a forging process with np = 16.0. A sample of size 100 is taken each day and analysed. What is the probability that a shift in the process average to 20 will be detected on the first day after the shift? Also find the smallest sample size that will give a positive lower control limit?

(OR)

b) The concentration of a certain chemical is being studied. From the process samples are taken every hour and the concentration is determined in the testing

laboratory. The results are as follows. Construct X- chart and moving range chart.

Hour	Concentration (%)	Hour	Concentration (%)
1	11.0	7	6.7
2	6.5	8	5.6
3	11.5	9	8.1
4	5.0	10	12.1
5	7.0	11	9.4
6	5.8	12	10.5

14 a) What is AOQL? Construct AOQ curve for the sampling plan n = 80 and c = 2 and determine AOQL. Assume that the lot size is very large.

(OR)

b) i) How double sampling plan is operated? Explain its OC curve. (8)

ii) How a sampling plan is selected from MIL-STD- 105 E sampling standard? What are its salient features. (8)

15 a) Discuss the following angular measuring instruments.

i) Bevel protractor ii) Sine bar iii) Autocollimator

OR

b) Name the various methods of NDT. Explain any two methods in detail with neat sketches.